

Notice of Allowability

Application No.

10/800,895

Examiner

LUONG T. NGUYEN

Applicant(s)

LEE, HYUNG-GUEN

Art Unit

2622

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☐ This communication is responsive to _____.
2. ☒ The allowed claim(s) is/are 1-4, 6-12, 14-16 (renumbered as 1-14, respectively).
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☒ All b) ☐ Some* c) ☐ None of the:
 1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☒ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date 20070927.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413),
Paper No./Mail Date 20070927.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

Luong T. Nguyen

**LUONG T. NGUYEN
PATENT EXAMINER**

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Frank Chau on 9/27/2007.

2. The application has been amended as follows:

IN THE DRAWINGS.

Figure 1 has been labeled "PRIOR ART".

IN THE SPECIFICATION

On Page 5, "wherein a, b are integer numbers." has been inserted on line 8.

On Page 17, "wherein a, b are integer numbers." has been inserted on line 4.

IN THE CLAIMS.

Claim 1 (line 5), "the data that is vertical linear" has been changed to --the data are also vertical linear--.

Claim 1 (line 5), "and data are" has been changed to --and the data are also--.

Claim 1 (line 6), "nonlinear LPF filtered and the sum" has been changed to --nonlinear LPF filtered, and the sum--.

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Claim 1 (line 10), “(HPF) filtered and the data is nonlinear LPF filtered are added” has been changed to --“(HPF) filtered, and the data are also nonlinear LPF filtered--.

Claim 1 (line 15), “BPF filtered and the data are horizontal BPF filtered” has been changed to --“BPF filtered, and the data are also horizontal BPF filtered--.

Claim 1 (line 19), “BPF filtered and the data are” has been changed to --“BPF filtered, and the data are also--.

Claim 1 (line 20), “nonlinear LPF filtered are added” has been changed to --nonlinear LPF filtered--.

Claim 1 (line 24), “BPF filtered and the data are nonlinear” has been changed to --“BPF filtered, and the data are also nonlinear--.

Claim 2 (line 4), “pixel window” has been changed to --pixel window data--.

Claim 2 (line 4), “horizontal LPF” has been changed to --horizontal linear LPF--.

Claim 2 (lines 4-5), “the product thereof” has been changed to --a value thereof--.

Claim 2 (line 5), “the row” has been changed to --a row--.

Claim 2 (line 12), “the average value” has been changed to --the average product--.

Claim 2 (line 13), “the column” has been changed to --a column--.

Claim 3 (line 2), “the row” has been changed to --a row--.

Claim 3 (line 3), “pixel window” has been changed to --pixel window data--.

Claim 3 (line 4), “the result” has been changed to --a result--.

Claim 3 (line 5), “the column” has been changed to --a column--.

Claim 3 (line 12), “the product thereof” has been changed to --a product thereof--.

Claim 4 (line 3), “pixel window” has been changed to --pixel window data--.

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Claim 4 (line 7), "the product" has been changed to --a product--.

Claim 5 has been canceled.

Claim 6 (line 1), "The color signal interpolator of claim 5," has been changed to --The color signal interpolator of claim 1, wherein the nonlinear LPF filtering of the 5 x 5 pixel window data is performed by outputting interpolation data G' and B' by performing equations 1 and 2, respectively, for center pixel R; outputting interpolation data G' and R' by performing the equations 1 and 2, respectively, for center pixel B; and outputting interpolation data B' and R' by performing equations 3 and 4, respectively, for both center pixels Gr and Gb,--.

Claim 6 (line 8), "pixel window centered around the center pixel" has been changed to --pixel window data centered around the center pixel--.

Claim 6, after the last line 16 of the claim 6, "wherein a, b are integer numbers." has been inserted.

Claim 7 (line 2), "stores pixel data" has been changed to --stores the pixel data--.

Claim 8 (line 3), "performs first" has been changed to --performs the first--.

Claim 8 (line 4), "wherein: data are" has been changed to --wherein the data are--.

Claim 8 (line 5), "BPF filtered; data are vertical" has been changed to --BPF filtered; the data are also vertical--.

Claim 8 (line 6), "data are nonlinear LPF" has been changed to --the data are also nonlinear LPF--.

Claim 8 (line 9), "second interpolation" has been changed to --the second interpolation--.

Claim 8 (line 9), "wherein data are HPF" has been changed to --wherein the data are HPF--.

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Claim 8 (line 10), “filtered and data are nonlinear LPF filtered and” has been changed to --filtered, and the data are also nonlinear LPF filtered, and--.

Claim 8 (line 13), “third interpolation” has been changed to --the third interpolation--.

Claim 8 (line 13), “wherein data are” has been changed to --wherein the data are--.

Claim 8 (line 14), “filtered and data are horizontal BPF filtered” has been changed to --filtered, and the data are also horizontal BPF filtered--.

Claim 8 (line 17), “wherein data are” has been changed to --wherein the data are--.

Claim 8 (line 18), “BPF filtered and data are nonlinear LPF” has been changed to --BPF filtered, and the data are also nonlinear LPF --.

Claim 8 (line 19), “filtered and the sum” has been changed to --filtered, and the sum--.

Claim 8 (line 22), “wherein data are horizontal” has been changed to --wherein the data are horizontal--.

Claim 8 (line 23), “BPF filtered and data are nonlinear LPF” has been changed to --BPF filtered, and the data are also nonlinear LPF--.

Claim 9 (line 3), “in which data” has been changed to --in which the data--.

Claim 9 (line 4), “(BPF) filtered, data that are vertical linear” has been changed to --(BPF) filtered, the data are also vertical linear--.

Claim 9 (line 5), “and data that are nonlinear LPF” has been changed to --and the data are also nonlinear LPF--.

Claim 9 (line 8), “in which data are high pass filter (HPF) filtered” has been changed to --in which the data are high pass filter (HPF) filtered,--.

Claim 9 (line 9), “are nonlinear” has been chanted to --are also nonlinear--.

Claim 9 (line 12), "in which data are vertical BPF filtered" has been changed to --in which the data are vertical BPF filtered,--.

Claim 9 (line 13), "are horizontal" has been changed to --are also horizontal--.

Claim 9 (line 17), "BPF filtered and the data that are nonlinear-- has been changed to --BPF filtered, and the data that are also nonlinear--.

Claim 9 (line 21), "BPF filtered and the data that are nonlinear-- has been changed to --BPF filtered, and the data that are also nonlinear--.

Claim 10 (line 4), "pixel window" has been changed to --pixel window data--.

Claim 10 (line 4), "horizontal LPF" has been changed to --horizontal linear LPF--.

Claim 10 (line 5), "the product" has been changed to --a value--.

Claim 10 (line 5), "the row" has been changed to --a row--.

Claim 10 (line 12), "the average value" has been changed to --the average product--.

Claim 10 (lines 12-13), "the column" has been changed to --a column--.

Claim 11 (line 2), "the row" has been changed to --a row--.

Claim 11 (line 3), "pixel window" has been changed to --pixel window data--.

Claim 11 (line 4), "the product" has been changed to --a product--.

Claim 11 (line 5), "the column" has been changed to --a column--.

Claim 11 (line 6), "pixel window" has been changed to --pixel window data--.

Claim 11 (line 12), "the product" has been changed to --a product--.

Claim 12 (line 3), "pixel window" has been changed to --pixel window data--.

Claim 12 (line 7), "the product" has been changed to --a product--.

Claim 13 has been canceled.

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Claim 14 (line 1), "The color signal interpolation method of claim 13,"
has been changed to

--The color signal interpolator of claim 9, wherein the nonlinear LPF filtering of the 5 x 5 pixel window data is performed by outputting interpolation data G' and B' by performing equations 1 and 2, respectively, for center pixel R; outputting interpolation data G' and R' by performing the equations 1 and 2, respectively, for center pixel B; and outputting interpolation data B' and R' by performing equations 3 and 4, respectively, for both center pixels Gr and Gb,--.

Claim 14 (line 8), "pixel window centered around the center pixel" has been changed to
--pixel window data centered around the center pixel--.

Claim 14, after the last line 16 of the claim 14, "wherein a, b are integer numbers." has been inserted.

Claim 15 (line 2), "storing pixel data" has been changed to --storing the pixel data--.

Claim 16 (line 3), "performing first" has been changed to --performing the first--.

Claim 16 (line 5), "the data are vertical linear" has been changed to --the data are also vertical linear--.

Claim 16 (line 6), "data are nonlinear LPF filtered and" has been changed to --data are also nonlinear LPF filtered, and--.

Claim 16 (line 8), "performing second interpolation" has been changed to --performing the second interpolation--.

Claim 16 (line 9), "wherein the data are HPF filtered and" has been changed to --wherein the data are HPF filtered, and--.

Claim 16 (line 10), “are nonlinear LPF filtered and” has been changed to --are also nonlinear LPF filtered, and--.

Claim 16 (line 12), “third interpolation” has been changed to --the third interpolation--.

Claim 16 (line 13), “BPF filtered and” has been changed to --BPF filtered, and--.

Claim 16 (line 14), “the data are horizontal BPF filtered and” has been changed to --the data are also horizontal BPF filtered, and--.

Claim 16 (line 16), “fourth interpolation” has been changed to --the fourth interpolation--.

Claim 16 (line 18), “the data are nonlinear LPF filtered and” has been changed to --the data are also nonlinear LPF filtered, and--.

Claim 16 (line 20), “fifth interpolation” has been changed to --the fifth interpolation--.

Claim 16 (line 22), “the data are nonlinear LPF filtered and” has been changed to --the data are also nonlinear LPF filtered, and--.

Allowable Subject Matter

3. Claims 1-4, 6-12, 14-16 are allowed.

The following is an examiner’s statement of reasons for allowance:

Regarding claim 1, the prior art of the record such as Sasaki et al. reference (US 7,206,021) discloses a hybrid pixel interpolating apparatus and hybrid pixel interpolating method, which comprises plurality of pixel interpolating parts $4_1 - 4_n$ (figure 1, column 6, line 2 – column 7, line 40), or Aoki reference (US 6,882,365) discloses an image data correction unit 300 (figure 16, column 8, lines 43 –67) for correcting the image data represented the captured image; the image data correction unit 300 comprises a set of interpolation filters 13a – 13d

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(figure 16, column 8, lines 43 –67). However, both of Sasaki et al. reference and Aoki reference fail to disclose or suggest a color signal interpolator comprising:

a first interpolator, which receives 5 x 5 pixel window data, and performs a first interpolation for each of center pixels R and B, wherein the data are horizontal linear low pass filter (LPF) filtered and vertical band pass filter (BPF) filtered, and the data are also vertical linear LPF filtered and horizontal BPF filtered, and the data are also nonlinear LPF filtered, and the sum of the filtered data is output as first interpolation data G’;

a fourth interpolator which receives the 5 x 5 pixel window data, and performs fourth interpolation for each of center pixels Gr and Gb, wherein the data are vertical linear LPF filtered and horizontal BPF filtered, and the data are also nonlinear LPF filtered, and the sum of the filtered data is output as fourth interpolation data B’ or R’, respectively; and

a fifth interpolator which receives the 5 x 5 pixel window data, and performs fifth interpolation for each of center pixels Gr and Gb, wherein the data are horizontal linear LPF filtered and vertical BPF filtered, and the data are also nonlinear LPF filtered, and the sum of the filtered data is output as fifth interpolation data R’ or B’, in combination with other claim limitations of claim 1.

Claims 2-4, 6 are allowed for the reasons given in claim 1.

Claims 9-12, 14 are method claims of apparatus claims 1-4, 6. Therefore, claims 9-12, 14 are allowed for the reasons given in claims 1-4, 6.

Regarding claim 7, the prior art of the record such as Sasaki et al. reference (US 7,206,021) discloses a hybrid pixel interpolating apparatus and hybrid pixel interpolating method, which comprises plurality of pixel interpolating parts $4_1 - 4_n$ (figure 1, column 6, line 2 – column 7, line 40), or Aoki reference (US 6,882,365) discloses an image data correction unit 300 (figure 16, column 8, lines 43 –67) for correcting the image data represented the captured image; the image data correction unit 300 comprises a set of interpolation filters 13a – 13d (figure 16, column 8, lines 43 –67). However, both of Sasaki et al. reference and Aoki reference fail to disclose or suggest a digital image signal processor comprising:

a color signal interpolator that performs first group interpolation through fourth group interpolation, according to the control of the control signal, wherein: in the first group interpolation, interpolation data G' , B' , and R' are output through first interpolation, second interpolation, and third interpolation, respectively, for center pixel R within the 5×5 pixel window data; in the second group interpolation, interpolation data G' , R' , and B' are output through the first interpolation, the second interpolation, and the third interpolation, respectively, for center pixel B within the 5×5 pixel window data; in the third group interpolation, interpolation data G' , B' , and R' are output through the third interpolation, fourth interpolation, and fifth interpolation, respectively, for center pixel Gr within the 5×5 pixel window data; and in the fourth group interpolation, interpolation data G' , R' , and B' are output through the third interpolation, the fourth interpolation, and the fifth interpolation, respectively, for center pixel Gb within the 5×5 pixel window data; and

a control unit that determines which color among colors R , B , Gr , and Gb the center pixel is, and according to the color of the center pixel, generates the control signal indicating the first

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group interpolation through the fourth group interpolation, in combination with other claim limitations of claim 7.

Claim 8 is allowed for the reason given in claim 7.

Claims 15-16 are method claims of apparatus claims 7-8. Therefore, claims 15-16 are allowed for the reasons given in claims 7-8.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Sasaki et al. (US 7,206,021) discloses hybrid pixel interpolating apparatus and hybrid pixel interpolating method.

Aoki (US 6,882,365) discloses direction-sensitive correction method and system for data including abrupt intensity gradients.

Yamagami et al. (US 5,323,233) discloses image signal processing apparatus having a color filter with offset luminance filter elements.

Shiraishi et al. (US 5,280,347) discloses color image sensing device.

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Sasaki et al. (US 5,319,451) discloses color signal processing apparatus using a common low pass filter for the luminance signal and the color signals.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LUONG T. NGUYEN whose telephone number is (571) 272-7315. The examiner can normally be reached on 7:30AM - 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID L. OMETZ can be reached on (571) 272-7593. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LN
09/27/07



LUONG T. NGUYEN
PATENT EXAMINER

Approved
LN
9/27/07

FIG. 1 (PRIOR ART)

G	R	G	R	G	R	G	R
B	G	B	G	B	G	B	G
G	R	G	R	G	R	G	R
B	G	B	G	B	G	B	G
G	R	G	R	G	R	G	R
B	G	B	G	B	G	B	G
G	R	G	R	G	R	G	R
B	G	B	G	B	G	B	G

FIG. 2

